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## **Guidelines for Performance Testing of Multi Client Systems**

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### **Abstract: -**

Multi client systems are playing a crucial role in today's world, with information flooded into billions and trillions of web pages. The world is heavily dependent on e-Commerce and other online information systems. These systems can achieve growth only if they are accessible very fast. As the users accessing information increase the performance of such systems becomes deciding factor in driving their growth and existence. Performance benchmarking is conducted to verify if system is acceptable, scaleable and will meet performance requirements.

In this paper we present general guidelines of how to do performance testing for multi client systems.

**Key words: -** Performance Testing; Testing Guidelines; Web site performance;

### **1. Introduction**

A performance test helps you determine whether a multi-client system is performing within user-defined standards under varying loads. Performance tests are done against database servers, TUXEDO servers, and Web servers to find the point at which the system breaks under load or stress.

Performance tests typically involve loading the server with many virtual testers. For example, a timer in one virtual tester to find out how much time a query takes when 1000 other virtual testers are sending requests to the same server at the same time.

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The common kind of performance testing that would be carried out is Load testing. Load testing verifies the acceptability of the server's performance behavior using varying workloads while the operational conditions remain constant.

Now- a- days there are many tools, which can be used to do performance testing. We can have list of such tools from [2]. The tools can be effectively used coupled with set of guidelines, which describe a baseline on which performance testing can be started and can proceed smoothly.

## **2. Types of Performance Testing**

Performance Testing includes:

1. Load Testing
2. Stress Testing
3. Contention Testing
4. Configuration Testing

### **2.1 Load Testing**

This is useful to test the system to its limits by saturating it with high volumes of data, transactions and users. Load testing is used for predicting the life expectancy of the system when compared with planned business growth

### **2.2 Stress Testing**

Stress Testing is undertaken to identify bottlenecks and breakpoints in the system. This will provide a measurement of response times, throughput and resource consumption at levels beyond the initial load, and will enable the Performance and Capacity Management teams to identify when additional resources or corrective action must be taken to meet future business growth demands.

### **2.3 Contention Testing**

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Contention tests involve executing a combination of virtual testers on one or more computers to simulate an actual user environment so as to depict the real time user environment.

## **2.4 Configuration Testing**

In modern days heterogeneous client/server environments, each user's computer can have a different mix of hardware and software, creating a risk that the application software will run on some computers only but not on others. Configuration testing is used to ensure that your product will run on multiple platforms.

We have given a very brief description of various performance tests here; further to this more information on requirements of performance testing and other related information could be had from [1].

## **3. General Guidelines for Performance Testing**

The following is list of general guidelines for performance testing of a multi client system.

- Plan for test
- Useful formats for displaying system usage
- Decide which business process to test
- Document business process properties
- Establish which data to use
- Define what resources to be test
- When performance testing, can be started
- Execution and Communication

### **3.1 Plan for Test: -**

Once we are ready for a test by following all the above guidelines, we need to have a proper planning and resources available with us to perform actual testing. The

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performance test plan should describe the overall strategy that will be followed for testing the final application and leading up to the completed application.

Proper planning for business scenarios, transactions, and application flow/navigation before generating scripts in any of the tools like Rational Robot or other, ease the work schedule and can meet the requirements in time.

Also we need to make sure that resources are available for the testing on time and the plan is communicated to every one and also to meet any emergencies we need to have back-up resources.

Testing will be a resource intensive activity so do performance testing too. Tester may need to reserve special hardware or he/she may have to construct large, complex data sets for which tester always will have to spend large amounts of time verifying that the expected results section of each test case actually corresponds to the correct behavior. This can be managed better only if it is planned well in advance.

The Project Management tools like MS-Project along with email can be used effectively for planning the performance testing. Good planning can find faults before live testing begins.

### 3.2 Useful formats for displaying system usage: -

We need to define necessary formats for measuring the performance of the application. Possible formats may be:

#### 3.2.1

**Task Distribution Diagram:** The task distribution diagram gives us the information on number of users for a particular transaction and the time of the load. The peak usage and off-usage are decided from this Diagram. We can say that it gives the information about various business tasks distributed during the day with regard to the application under test as follows.

- a) Which business tasks
- b) How many operations at what times of the day

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### 3.2.2

**Transaction Profile Sheet:** This will give the information about the transactions name and their priority levels with regard to the scenario we are testing. It means it will give a summary of number of transactions taken place at a particular point of time, screen navigation.

- a) It will give information regarding, how many operations on an average, how many at peaks are happening.
- b) It will give information on how much database activities are ongoing.
- c) It gives the amount of risk to business if task fails.

### 3.2.3

**User Profile Diagram:** This graph depicts the user load, pages accessed by users with tasks performed by the users.

- a) It gives the list of tasks that each real user performs.
- b) It gives information regarding the ratio of different tasks for each user?
- c) User Profile Diagram gives us information regarding where to get System Usage Information.

### 3.2.4

**Users:** Different types of users participating in testing. Following are the users who can participate in doing performance testing of an application.

- System Administrators
- IT Manager
- IT Documentation
- QA Personnel
- Web developers and Web masters

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### **3.3 Decide which business process to test**

The following are some criteria for decision-making about which business process it to be tested first. It is very important step as it guides the total performance testing process.

#### **3.3.1. Processes having the highest business risks are tested.**

It is always best to test the process which involves the highest business risk, as an example we can take a process in a typical e-Commerce kind of web site, the payment acceptance and issuing a receipt of it, is one of the big risk area because if this is not working properly, we will end up delivering items without receiving money.

#### **3.3.2 Processes that are most frequently used are tested.**

The processes which are used most frequently need to be selected for test other wise system might collapse; the login process is a typical example of this. Suppose if a customer logs in to the site and does not get the response properly within time, he may never use the site.

#### **3.3.3 Applications peak hours of the day are analyzed.**

Certain web sites or applications are used some times more frequently. Suppose the banking websites are used during morning more if the site is limited to a particular geo graphical region.

#### **3.3.4 Peak days of the month, quarter, and year.**

Another criteria can be a site which sells gifts online can have more demand during Chirstmus season or during holidays, if it is in eastern countries like India ...etc, during their festival times.

Further to the above-specified points, the following criteria can also be considered

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### **3.3.5 Processes, which are linked (data dependent).**

Another good source of doing performance test are the processes, which are linked, i.e. once a process starts the output of it will be sent to another process for further processing. These kinds of process are key to system execution.

### **3.3.6 Processes which are resource intensive**

Another criteria can be the processes, which consume more resources. We can consider the payment gateway as an example for this. It requires current server, database, third party server and its resources.

## **3.4 Document business process properties**

The purpose of documenting the business process is to obtain information necessary to create virtual users such as:

- a) User Actions:** - The user actions are nothing an action that can be measured. Typical examples are Users subscribing to email newsletters, users downloading an article from a journal...etc.
- b) Expected results of each action:** - This is nothing but the output of the user action example users getting a news letter for which they subscribed, article getting downloaded and getting displayed on users computer.
- c) Input data fields:** - The input data fields are either textbox, combobox, check box. Etc where user can enter input data.
- d) Valid data for input:** - The valid data for input fields; a typical example can be correct format of email address

Identifying above properties gives clear scope for doing testing against each user action.

## **3.5 Establish which data to use**

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We should define data is which will be used for 'Performance Testing' before actually starting it.

Let us take a website of a bank where in users do transactions like transferring money from one account to other account, the key data that can be used to measure the performance of such a system is to observe the huge number of transactions and how the well the system executes these transactions. We can test this by creating huge number of transactions concurrently.

Any real time data can also be imported from development servers and the same is used to analyze the results and report. The development team uses the same if there is any 'Performance Tuning' required.

It is always important to execute these performance tests only on production servers with already defined data may be virtual users can be used. However we should not use the 'Test Server' during the execution of for 'Performance Testing' as it does not represent the production environment, which is our final system.

### **3.6 Define what resources to be tested**

Performance testing involves defining the resources that are to be involved in testing.

Resources like Application Servers like Weblogic, WebSphere, Tomcat, IIS Server ...etc, Database Server like Oracle, DB2, etc and Network resources should be tested while doing performance testing. These are the resources, which form the total system under testing so defining them is necessary.

Each resource needs to be defined to have its own performance limits based how the current systems is run considering facts like what speed we want to run our system. For example let us say if we want users from a web site to download a file of 1 MB with in 30 sec when there were around 1000 concurrent users the performance criteria will be definitely different from situation where in we wish users finish 1 MB download in 10 sec as baseline with same number of concurrent users.

Thus we have to define resources and its performance limits.

### **3.7 When performance testing, can be started**

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Criteria before starting performance testing can be selected as follows.

**a) Performance testing should be done after the completion of functional testing.**

Functional testing is defined as confirms the system is working as it is expected and all aspects of the user interface, navigation between pages and off-site, multilingual navigation, etc. are tested. There is no question of doing performance testing when functional testing is not done. So functional testing should be completed before starting performance testing.

**b) Performance testing should be done at the time of system-testing phase.**

System testing is the phase of software testing in which the complete system is tested as per [3], so performance testing also included in this. It should be taken up during system testing phase only.

**c) Required tools should be identified for doing performance testing.**

There are lot of tools available for doing performance testing at [1] . We need to identify any tools that may be useful in doing system testing and then procure those tools and people, who can work with those tools, and then we can start performance testing.

**3.8 Execution and Communicating Results: -**

Once actual performance testing is completed, we need to summarize the findings of tests and the results to be distributed to respective module or resource owners for corrective measures.

Once the these corrective measures or fixes are done then once again the entire tests need to be repeated and a final summary report to be distributed or to be made available to all the users involved using intranet.

**Conclusion: -**

In this paper, we tried to identify a base line of how performance tests in a typical multi client or web site development environment can be done effectively. We do hope that it will be useful to various groups of software engineers, Testers, QA personnel, System Administrators ...etc.

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We have used these guidelines in testing various web based systems, using Rational Test Manager a sophisticated tool that can be used for automating performance tests on client/server systems and are very much satisfied with usefulness of these guidelines in successfully executing performance tests.

For any further information corresponding author and Research Scholar Mr. T.Sukumar Subahan can be contacted on [subahan.t@gmail.com](mailto:subahan.t@gmail.com) +91 9886461761

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